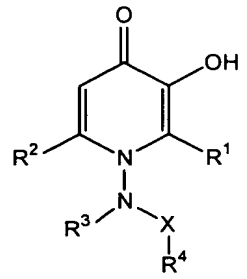
CLAIMS:

What is claimed is:

1. An N-substituted 3-hydroxy-4-pyridinone compound of the formula (I):



(I)

or a pharmaceutically acceptable salt thereof, or prodrug thereof, wherein:

X is selected from the group: CH_2, C(O), C(S), $P(O)R^3R^4$, SO_2, C(=NH)NH, C(O)NH, and C(S)NH;

R^1 and R^2 are independently selected from: H, C_1-C_{10} alkyl substituted with 0-5 R^5, C_2-C_{10} alkenyl substituted with 0-5 R^5, aryl substituted with 0-3 R^5, and heteroaryl substituted with 0-3 R^5;

R^3 and R^4 are independently selected from: C_1-C_{10} alkyl substituted with 0-5 R^5, C_2-C_{10} alkenyl substituted with 0-5 R^5, aryl substituted with 0-3 R^5, heteroaryl substituted with 0-3 R^5, or R^3 and R^4 may be taken together to form a C_5-C_7 cyclic alkyl group optionally interrupted with O or NR^6;

R^5 is elected from: OH, $C(=O)R^6$, $C(=O)OR^6$, $C(=O)NR^6R^7$, $PO(OR^6)(OR^7)$, $S(O)_2OR^6$;

R^6 and R^7 are independently selected from: H, C_1-C_{10} alkyl, or aryl.

2. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is selected from the group: CH_2, C(O), and SO_2;

R^1 and R^2 are independently selected from: H, C_1-C_3 alkyl substituted with 0-2 R^5, and C_2-C_3 alkenyl substituted with 0-2 R^5;

R^3 and R^4 are independently selected from: C_1-C_6 alkyl substituted with 0-3 R^5, C_2-C_6 alkenyl substituted with 0-3 R^5, aryl substituted with 0-3 R^5, heteroaryl substituted with 0-3 R^5, or R^3 and R^4 may be taken together to form a C_5-C_7 cyclic alkyl group optionally interrupted with O or NR^6;

R^5 is elected from: OH, C(=O)OH, and $C(=O)NR^6R^7$;

R^6 and R^7 are independently selected from: H and C_1-C_6 alkyl.

3. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is selected from the group CH_2, C(O), and SO_2;

R^1 is H;

R^2 is methyl or ethyl group;

R^3 and R^4 are independently selected from: aryl, heteroaryl, or R^3 and R^4 may be taken together form a 5-7 membered cyclic alkyl.

4. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is CH_2;

R^1 is H;

R^2 is methyl;

R^3 and R^4 are taken together form a 6-membered cyclic piperidine ring.

5. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is CH_2;

R^1 is H;

R^2 is methyl;

R^3 and R^4 are taken together form a 6-membered cyclic morphine ring.

6. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is CH_2;

R^1 is H;

R^2 is ethyl;

R^3 and R^4 are taken together form a 6-membered cyclic morphine ring.

7. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is C(O);

R^1 is H;

R^2 is methyl;

R^3 is H;

R^4 is phenyl.

8. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is C(O);

R^1 is H;

R^2 is ethyl;

R^3 is H;

R^4 is phenyl.

9. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is C(O);

R^1 is H;

R^2 is methyl;

R^3 is H;

R^4 is 3-pyridine.

10. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is C(O);

R^1 is H;

R^2 is methyl;

R^3 is H;

R^4 is 4-pyridine.

11. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is C(O);

R^1 is H;

R^2 is ethyl;

R^3 is H;

R^4 is 2-thiophene.

12. The N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 wherein:

X is SO_2;

R^1 is H;

R^2 is methyl;

R^3 is H;

R^4 is phenyl.

13. A method for the preparation of an N-substituted 3-hydroxy-4-pyridinone compound according to claim 1.

14. A pharmaceutical composition comprising a therapeutic effective amount of an N-substituted 3-hydroxy-4-pyridinone according to claim 1 for the treatment of iron overload.

15. A pharmaceutical composition comprising a therapeutic effective amount of an N-substituted 3-hydroxy-4-pyridinone compound according to claim 1 and a

therapeutic metal for the treatment of diseases, such as parasitic and viral infections, conditions associated with inflammation and infection, and conditions mediated by collagen formation.

16. A radiopharmaceutical of the formula:

$$M(C_h)_n,$$

and pharmaceutically acceptable salt thereof, wherein:

M is a radionuclide selected from: ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{99m}Tc, ^{111}In, ^{90}Y, ^{149}Pr, ^{153}Sm, ^{159}Gd, ^{166}Ho, ^{169}Yb, ^{177}Lu, ^{186}Re, and ^{188}Re;

n is 2 or 3;

X is CH_2;

R^1 is H;

R^2 is methyl;

R^3 and R^4 are taken together form a 6-membered cyclic piperidine ring.

17. The radiopharmaceutical according to claim 16 wherein:

M is a radionuclide selected from: ^{67}Ga, ^{68}Ga, ^{99m}Tc, and ^{111}In;

n is 3.

18. The radiopharmaceutical according to claim 16 wherein:

M is ^{111}In;

n is 3.

19. The radiopharmaceutical according to claim 16 wherein:

M is ^{111}In;

n is 3;

X is CH_2;

R^1 is H;

R^2 is methyl;

R^3 and R^4 are taken together form a 6-membered cyclic piperidine ring.

20. The radiopharmaceutical according to claim 16 wherein:

M is ^{111}In;

n is 3;

X is CH_2;

R^1 is H;

R^2 is methyl;

R^3 and R^4 are taken together form a 6-membered cyclic morphine ring.

21. An MRI contrast agent of the formula:

$$M(C_h)_n,$$

and pharmaceutically acceptable salt thereof, wherein:

M is a paramagnetic metal ion of atomic number 21-29, 42-44, or 58-70;

n is 2 or 3;

C_h is an N-substituted 3-hydroxy-4-pyridinone according to claim 1.

22. The MRI contrast agent according to claim 21 wherein:

M is selected from: Fe^{3+} and Mn^{2+} and Gd^{3+};

n is 2 or 3;

C_h is an N-substituted 3-hydroxy-4-pyridinone according to claim 1.

23. The MRI contrast agent according to claim 21 wherein:

M is Fe^{3+} and Mn^{2+};

n is 2 or 3;

C_h is an N-substituted 3-hydroxy-4-pyridinone according to claim 1.

24. The MRI contrast agent according to claim 21 wherein:

M is Fe^{3+};

n is 3;

C_h is an N-substituted 3-hydroxy-4-pyridinone according to claim 1.

25. A method of preparing a radiopharmaceutical of claim 16.

26. A method of preparing an MRI contrast agent of claim 21.

27. A pharmaceutical composition comprising a metal chelate of the formula:

$$M(C_h)_n,$$

and pharmaceutically acceptable salt thereof, wherein:

M is a metal ion or a metal-containing core selected from: Ca^{2+}, Sn^{2+}, Cu^{2+}, Zn^{2+}, V^{3+}, $V^{5+}(O)$, or $V^{5+}(O)$-O-$V^{5+}(O)$;

n is 2 or 3;

C_h is an N-substituted 3-hydroxy-4-pyridinone according to claim 1.

27. A method of treating of a disease such as viral infections, conditions associated with inflammation and infection, and conditions mediated by cell-proliferation or collagen formation, comprising administering a patient in need of such treatment a therapeutically effective amount of a pharmaceutical composition according to claim 26.